

Quarterly Status Report No. 12
for the period
23 June 1967 to 22 September 1967

Design, Development, Fabrication, and
Installation of the 105-inch Lunar
and Planetary Telescope at McDonald Observatory

Contract NASr-242
SC/44-012-025- (056)

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Program

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Purpose and Scope

The purpose of this report is to provide NASA management with the progress and status of the 105-inch lunar and planetary telescope planned for The University of Texas McDonald Observatory.

This report covers activities and progress under Contract NASr-242, SC/44-012-025-(056) during the quarterly period from June 23, 1967 to September 22, 1967. For completeness and continuity, some background is given and the future outlook is summarized.

SECTION I

I. Program Management

A. Background

The University of Texas has a contract (NASr-242) with NASA to construct a telescope for studies of planetary atmosphere and surfaces, particularly those of Mars and Venus. Under the contract, NASA has agreed to finance the 105-inch telescope for that purpose. The telescope will be installed in facilities provided by The University at its McDonald Observatory on Mt. Locke near Ft. Davis, Texas.

The original target date was established to allow observations during the 1967 opposition of Mars. Due to delays in the design and fabrication of the telescope, the target date has been re-established to permit observations around and during the 1969 Mars opposition.

Westinghouse Sunnyvale was awarded the subcontract for the telescope mount and controls. Other sub-contracts are in force for the coude spectrograph, telescope optics, building and dome, and other equipment necessary to operate the telescope.

B. Current Reporting Period

1. Key Management Actions and Events

- a. The University appointed an acting program manager, Mr. T. E. Burke, who resided at Westinghouse to provide daily management attention to the design and fabrication of the telescope.
- b. Westinghouse assigned a full-time Program Manager, Mr. D. A. Small, to be responsible for coordinating all Westinghouse matters concerning the design and fabrication of the telescope.
- c. Weekly Review and Progress Reports were instituted to provide Westinghouse and University management more detailed information on manufacturing progress and potential problems and delays.

2. Major NASA Reviews

Program Reviews were held on July 7, 1967 and September 19, 1967. The highlights of each review are as follows:

a. Program Review of July 7, 1967

The status was presented for each major phase of the program.

Current cost projections were summarized by University management.

A plan for planetary observations was presented to NASA by Dr. H. J. Smith, Director of McDonald Observatory.

Action items resulting from the review were:

- A review of Westinghouse shipping and installation instructions
- Analysis of University in-house efforts
- Improvement of reporting system
- Evaluation of Westinghouse management
- Estimate of cost to completion

b. Program Review of September 19, 1967

The focal point for this review was the Westinghouse sub-contract. Mr. T. E. Burke, Acting UT Program Manager, presented schedules, cost analysis, and management actions pertaining to the Westinghouse efforts.

The following specific management actions were noted:

- Both the University and Westinghouse have appointed full-time Program Managers
- A top management policy meeting was held to insure close communication between University and Westinghouse officials
- A weekly shop tour and status report has been instituted at Westinghouse to insure program management attention to fabrication efforts
- Concentrated efforts have been made to expedite information flow and decisions between the University and Westinghouse

C. Future Outlook

1. Program Manager

Mr. G. Robert Blitch will be added to the University staff in the capacity of Program Manager for the 105-inch Telescope. Mr. T. E. Burke, who has been Acting Program Manager, will continue to serve in an advisory capacity. The transition is expected to be effective about November 1, 1967.

2. Reviews and Reports

Since monthly reviews by NASA have proved beneficial, they will be continued through the completion of the program unless otherwise dictated by NASA.

Weekly Program Reviews will be continued at the University and weekly progress reports will be provided to University management. The reviews will include all aspects of the program.

A three-level reporting system will be instituted by the University. Level 1 reports will include schedule and status on the major areas of the program; Telescope Mount and Controls, Basic Telescope Optics, Coude Spectrograph, Building and Dome Construction. The Level 1 charts and status will be included in the Quarterly Report to NASA.

Level 2 will include the next level of detail under the Level 1 items. Level 2 reports will provide the basis for Monthly Reviews of schedules and status.

Level 3 will be the most detailed of the three levels and will provide a daily/weekly schedule, milestone achievement, and status. The Level 3 reports will be used in the weekly review and progress report.

SECTION II

II. Hardware and Site Preparation

A. General Information

This section contains the progress and status of hardware and site preparation. The Level 1 Schedules (see Appendix) depict milestone accomplishment and show future planned milestones.

B. Major Items (Level 1)

1. Telescope Mount and Controls

Contractor: Westinghouse Electric Corporation
Sunnyvale, California

Work on the telescope mount and controls has proceeded with some delays encountered. The delays were caused primarily by (1) machine availability, and (2) drive and control system definition. At the end of the reporting period, the telescope, according to the Westinghouse modified PERT network, Revision I, was about a month over-all behind schedule, being paced by the polar axis shaft and declination housing. June 1968 is still the target date for Westinghouse completion. Some schedule recovery may be possible by resequencing some operations. During this period, an Intergrated Test Plan was prepared by Westinghouse. The plan, which will be included in the Westinghouse modified PERT network, lists all shop, vendor, and field tests to be performed by the contractor.

Status of Major Components is as follows:

Polar Axis Shaft - in finish machining on the planer mill; final operation before match fitting with the counterweight will be on the gap lathe; assessed about one month behind schedule.

Polar Axis Counterweight - layout has been completed; ready to be drilled and machined.

Pit Assembly Area - pit has been completed; assembly has started.

Bearing Pedestals - both pedestals in final drilling.

Inner Sleeve - has been completed; ready for fit to shaft.

Declination Housing - has moved through the Mesta mill, now about one week behind schedule.

Primary Mirror Cell - final welding completed; now ready for finish machining; about one week behind.

Drive and Control System - Westinghouse submitted a plan for resolution of the drive and control system technical definition. The plan was approved by the University in concept. The University subsequently performed a technical review and sent comments to Westinghouse. Now, a clear understanding of the requirements for the drive and control system should preclude future delays in design and fabrication.

2. Basic Telescope Optics

Six relatively large mirrors are required for the completion and operation of the initial telescope: f/4 primary (107-inch optical diameter), f/9 Cassegrain secondary (43 inch), f/18 Cassegrain secondary (26-1/2 inch), f/33 coude secondary (33-1/2 inch), first coude-Cassegrain flat (38 inch), and second coude flat (34 inch). All of these mirrors, fabricated of fused silica by Corning or General Electric, were shipped to Davidson Optonics in 1966 for optical figuring.

The primary has been taken past an f/4 parabola and is currently being worked with the f/9 secondary to obtain the required Ritchey-Chretien figure. This final figuring has been in progress for about a month. The optician, Don Davidson, is optimistic that the work will be complete in the near future. The two flats and the f/18 and f/33 secondaries are in the polishing stage; however, the final touchup of the latter two mirrors must also be accomplished in conjunction with the completed primary.

3. Coude Spectrograph

Engineering Contractor: C. W. Jones Engineering
Commerce, California

The principal initial auxiliary instrument with the 105-inch telescope is a large horizontal coude spectrograph for high dispersion spectroscopy. While the design and mounting arrangements are adequate for an ultimately much larger system, available grating size and initial funding have established limits on the basic initial coude spectrograph to be completed with this contract, the general design for which was completed in the previous quarterly report period.

C. W. Jones Engineering is now preparing the bid drawings and specifications for the mechanical mounting of the optical parts of the basic initial coude spectrograph. The bid drawings and specifications are scheduled for completion in October. The package will be reviewed by

the University staff and requests for bids should be mailed in the first half of December with a target date for placing a contract in January.

Dr. Robert Tull, of The University of Texas Astronomy Department, has completed the optical design; mirrors for the two initial camera systems to be constructed are undergoing figuring. The spectrograph frame has been constructed and installed in the dome by the building contractor. The kinematic supports that connect the spectrograph frame to the telescope piers are scheduled to be delivered in November and will also be installed by the building contractor.

Large Camera Optics Contractor: University of Arizona

The large camera of the basic initial coude spectrograph uses a 59-inch camera mirror and 14-inch collimator; these are being finished by the optical shop of the Lunar and Planetary Observatory, University of Arizona. Although this work was expected to be completed by now, the optician, Mr. Robert Waland, has experienced problems in obtaining the final polish on the large mirror and accordingly has recently submitted his complete grinding and polishing schedule to the manufacturer of the optical blanks, Schott-Mainz, through the supplier, Fish-Shurman Corporation of New York, for review and suggestion. Waland is reluctant to try a different polishing compound on the large mirror for fear of damage to the excellent spherical surface already obtained; therefore, Fish-Shurman has furnished him with sample blanks from the same melt and temper cycle for experiment. The suppliers are confident the blank is not at fault since the glass is commonly used and this problem has never been reported in the past; they believe instead that a solution will be found by using a different polishing compound for the final finish.

Intermediate Camera Optics Contractor: Davidson Optronics
W. Covina, California

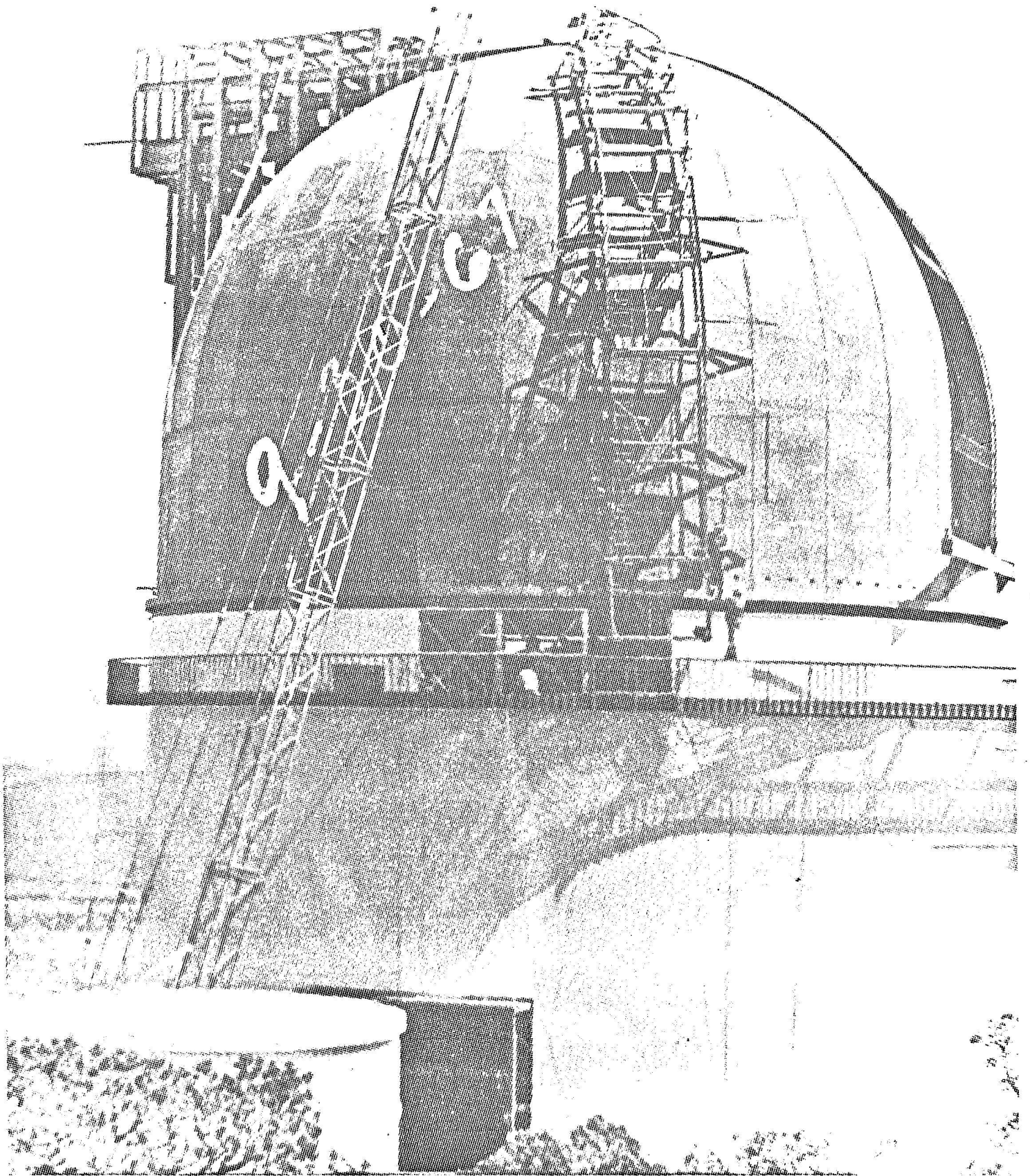
The optics for the intermediate camera of the basic coude spectrograph -- a 40-inch camera mirror and a 14-inch collimator -- are in the final stage of figuring, also at Davidson Optronics. It is expected that this work will be completed within a month. The acceptance test for these optics will be made with the spectrograph grating in the optical chain to insure that the correction given to the collimator is correct. A preliminary test has been performed but was inconclusive due to the test procedure. It is expected the next test will be adequate for acceptance of the optics.

4. Building and Dome Construction

Contractor: C. H. Leavell and Company
El Paso, Texas

C. H. Leavell, under a contract not funded by NASA, is building the 76-foot-diameter dome and building to house the 105-inch telescope.

The dome is scheduled to be completed to the point of accepting the telescope in January 1968, with all finish work completed by March 1968. At the present rate of progress Leavell will complete the job on or ahead of schedule and will place no constraint on the program. A recent photograph of the dome is shown on page 8.



APPENDIX - Level 1 Schedules

Telescope Mount and Controls
Basic Telescope Optics
Coude Spectrograph
Building and Dome Construction

The University of Texas
105-inch Telescope Program

Appendix 1

LEVEL 1	ITEM	Telescope Mount and Controls	DATE 22 Sept 67
MILESTONE	CY 66	CY 67	CY 68
Begin work on Polar Axis Shaft	J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D
Declination Hsg- Drawing Release	▲		
Sole Plates shipped to site		▲	
Polar Axis Shaft in Final Mach.		▲	
Shop Testing complete			▲
Ship Polar Axis			▲
Ship Declination Housing			▲
Ship Electrical Controls			▲
Polar Axis Installed			▲
Declination Housing Installed			▲
Ready for "Power On"			▲
Balancing Complete			▲
Field Installation Complete			▲
	J J A S O N D CY 66	J F M A M J J A S O N D CY 67	J F M A M J J A S O N D CY 68

LEVEL	ITEM	Basic Telescope Optics	DATE
	MILESTONE	CY 66 J J A S O N D	CY 67 J F M A M J J A S O N D
	Optical Blanks Received	▲	
	Begin figuring Primary Mirror	▲	
	Begin figuring secondary mirrors	▲	
	Complete Primary Mirror		▲
	Complete secondary mirrors		▲
	Optics Installation complete		▲
		J J A S O N D CY 66	J F M A M J J A S O N D CY 67

LEVEL 1	ITEM	Coude' Spectrograph	DATE 22 Sept 67
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	CY 66 J J A S O N D D J	CY 67 F M A M J J A S O N D	CY 68 J F M A M J J A S O N D
MILESTONE			
Begin figuring optics	▲		
Engineering completed		▲	
Complete figuring optics		▲	
Mechanical Contract Let		▲	
Mechanical Manufacture Complete			▲
Installation Complete			▲
	J J A S O N D D J CY 66	J F M A M J J A S O N D CY 67	J F M A M J J A S O N D CY 68

LEVEL	ITEM				
1	Building and Dome Construction				DATE 22 Sept 67
MILESTONE	CY 66 J J A S O N D	CY 67 J F M A M J J A S O N D	CY 68 J F M A M J J A S O N D		
Contract awarded	▲				
Construction begin		▲			
Sole Plates Installed			▲		
Crane Operational			▲		
Dome Operational			▲		
Building Complete				▲	
	J J A S O N D CY 66	J F M A M J J A S O N D CY 67	J F M A M J J A S O N D CY 68		